

**Example 1.**

A rocket is projected upwards at an initial velocity of 750 m/s. If there is no air friction,

(a) how long does the rocket take to reach its highest point?

$$\begin{array}{l} \uparrow v_0 = 750 \text{ m/s} \quad \downarrow a = -9.8 \text{ m/s}^2 \quad v = 0 \text{ at highest point} \\ t = ? \end{array}$$

$$v = v_0 + at$$

$$0 = 750 + (-9.8)t$$

$$-750 = -9.8t$$

$$t = 76.5 \text{ s}$$

(b) how high does it go?

→ use same values from (a)

$$v^2 = v_0^2 + 2ad$$

$$0 = 750^2 + 2(-9.8)d$$

$$d = 2.87 \times 10^4 \text{ m}$$

(c) if it lands at the same level as launch, how long is the rocket in the air?

- here,  $v = -750 \text{ m/s}$  (same speed as at launch, but in opposite direction.)

$$v = v_0 + at$$

$$-750 = 750 + -9.8t$$

$$\boxed{t = 153 \text{ s.}} \quad (\text{double the time up})$$